Aggression and Related Stressful Life Events among Chinese Adolescents Living in Rural Areas: A Cross-Sectional Study

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Abstract

Background: Aggression is a serious problem for both individuals and society. Despite progress in aggression research, its persistence among adolescents living in rural areas remains to be investigated. We evaluate the prevalence of aggression and the association between stressful life events and aggression in a nationwide, school-based sample of adolescents living in rural areas of China.

Methods: A sample of 13,495 Chinese rural students (7,065 boys and 6,430 girls; 11–20 years old) was selected from 15 representative rural areas from 5 provinces in China using stratified randomized cluster sampling. Aggression, stressful life events, neglect, emotional management, social support, and demographic characteristics were assessed via self-report questionnaires. Multivariate logistic regressions were used to estimate the association of stressful life events and aggression after controlling for confounds.

Results: The prevalence of aggressive behavior among Chinese adolescents living in rural areas was 24.3%. Regression analyses indicated that the odds of aggression were negatively influenced by chronic long-term stressors related to interpersonal problems (OR = 2.03, 95% CI [1.75–2.36]), health adaptation difficulties (OR = 1.21, 95% CI [1.09–1.34]), and other troubles (OR = 1.93, 95% CI [1.74–2.14]), even after adjustment for parental neglect, emotional management, social support, and other relevant factors.

Limitations: This study was cross-sectional; thus, it is necessary to validate the causal relationship between stressful life events and aggression via follow-up studies.

Conclusions: Aggression was prevalent among Chinese adolescents living in rural areas, and interpersonal problems, health adaption difficulties, and other troubles were considered potential independent risk factors for aggression.

Key Words:

Adolescents

Aggression

Stressful life events

Mental health

Rural communities

1. Introduction

Aggression is a behavioral and emotional response characterized by an intention to destroy objects or hurt other people. It is highly prevalent among children and adolescents (Krug et al., 2002). Indeed, a 2011 U.S. Centers for Disease Control report indicated that approximately 700,000 youth aged 10–24 years received hospital treatment because of assault-related injuries (Schlomer et al., 2015).

Previous studies have shown that aggression can have long-term harmful effects on individuals' development and social stability. Among adolescents with high levels of aggression, researchers identified increased risks of mental disorders, negative social relationships, non-suicidal self-injury, suicide, and death (Smokowski et al., 2013a; Tang et al., 2013; Zhang et al., 2012). Targets of aggression tend to exhibit poor psychological and physical health (Eslea, 2004; Haynie, 2001). Such outcomes of aggression among adolescents have exacted a considerable social and economic toll. For example, in the United States, beyond the human costs, the direct and indirect economic costs of aggression exceed $158 billion per year (Yeager et al., 2013). Such negative outcomes led the World Health Organization (WHO) to list aggression as a major public health problem in 1996 (WHO, 1996).

There is a rich body of literature on the risk factors of aggression among adolescents; such factors fall into the broad categories of genetic (and epigenetic), psychopathological, substance-abuse-related, social, and environmental. One psychopathological study showed that the serotonin, dopamine and neuroendocrine pathways are responsible for aggression. These pathways are in turn connected by

various signaling mechanisms, such as nitric oxide signaling, or brain-derived neurotrophic factor signaling (Waltes et al., 2016, Glick, 2015). Additionally, testosterone, cortisol, androgens, and glucocorticoids are all reported to be involved in aggression (Hagenbeek et al., 2016; Pavlov et al., 2012). In respect of genetic, gene polymorphism such as monoamine oxidase A (MAOA), catechol-O-methyltransferase (COMT), and dopamine receptor genes (e.g. DRD1, DRD2, DRD4) were found to be associated with aggressive behavior (Hohmann et al., 2009; Monuteaux et al., 2009; Sabol et al., 1998; Zai et al., 2012). Besides, several shared and mainly non-shared environmental factors also showed strong influences on aggression. In particular, family and classroom environments are associated with aggressive behavior, as is exposure to aggression in various forms of media, such as video games, television, music, movies, and books (Barth JM, 2004; Bauer et al., 2006; Strasburger, 2009). Furthermore, a large number of studies have demonstrated that abuse of alcohol, cannabis, tobacco, and drugs are all independently associated with aggression-related tendencies. Findings from the WHO's World Mental Health surveys indicated that there is greater drug involvement among younger adults than among older ones, and that the gender gap in drug use is closing (Degenhardt et al., 2008). Age is another risk factor for aggression. Furthermore, adolescents who are impulsive, highly sensitive, or immature might be at greater risk of aggression; in contrast, better emotional management ability or positive social support might serve as protective factors against engaging in socially unacceptable behavior (Bru et al., 2001; McLaughlin et

al., 2009).

Another factor that can elevate risk of aggressive behaviors is exposure to stressful experiences, and this is most relevant to the present discussion. For instance, Connell et al. showed that an ill sibling, failing a grade, and peer unpopularity are all positively associated with subsequent bullying behaviors (Connell et al., 2015). Furthermore, adolescents who have experienced neglect might be at greater risk of cognitive delays, mental problems, and poor social interaction, which in turn have a detrimental long-term impact on later outcomes in adolescence, including a greater likelihood of aggression and delinquency (Hildyard and Wolfe, 2002).

"Frustration-behavior", a theory initially put forward by Dollard, proposes that aggression is a subsequent behavioral reaction to frustration. Individuals who have strong perceptions of frustration attempt to eliminate the source of that frustration by becoming aggressive. Here, the strength of the aggression depends on the degree and duration of the exposure to frustration (Steinberg and Morris, 2001). Anderson's "general aggression model" similarly suggests that stressful life events are primary circumstantial factors significantly associated with aggression (Anderson and Bushman, 2002).

Despite growing academic interest in the relationship between aggression and stress, research has only recently emphasized the relationship between stress and psychopathology. Currently, with the exception of research on children's early life adversity, relatively little research has explored the degree to which stressful life events are associated with aggression among adolescents living in rural areas

(Robbins, 2008). Compared with urban adolescents, rural adolescents are viewed as more vulnerable, more likely to engage in school misbehavior, have lower rates of school belongingness, and are more likely perform aggressive acts (Smokowski et al., 2013b). A previous study demonstrated that the prevalence of mental and behavior problems among adolescents living in rural areas of China reached 19.8% (Zhang, 1999). Such a high rate is partially because of barriers in mental health service access in rural areas (Wrigley, 2005). Consequently, it is essential to investigate the demographic, psychological, social, and environmental factors that influence aggression among adolescents living in rural areas, and in particular, identify the association between stressful life events and aggression.

1.1.Aims

The primary objective of this study was to examine the epidemiological prevalence of aggression among adolescents living in rural areas of China. The secondary objective was to highlight the correlation between stressful life events and aggression. We focused on the stressful life events which can frequently influence adolescents' aggressive behavior, according to the literature (Liu, 1997): interpersonal relationships, academic pressure, punishment, loss, health adaptation problems, and other troubles, in order to better elucidate the specific life experiences which can predict subsequent aggression.

2. Methods

2.1. Procedure and participants

We used a stratified randomized cluster-sampling method to obtain a diverse and

representative sample of rural Chinese adolescents. First, in light of geographical features, socioeconomic status, and cultural diversity, 15 rural districts were selected in the following 5 provinces: Anhui, Yunnan, Guangdong, Heilongjiang, and Hubei. Second, with assistance from local educational administrative departments, we used systematic sampling to select one or two classes of students in each grade between 7^{th} and 12^{th} from 24 junior and 23 senior high schools. Third, we excluded students in selected classes with severe mental disorders (e.g., depression, anxiety, obsessive-compulsive disorder). A total of 344 classes, consisting of 14,472 students, were recruited, and a written informed consent letter was sent to these students' parents or guardians. Finally, participants in selected classrooms completed the self-administered survey, which took about 30–45 minutes to complete. Before students completed the questionnaire, they were told to answer each question honestly and carefully, and that questionnaire results would only be used for scientific research. However, 635 students refused to participate and 342 did not complete the questionnaire. Therefore, the final eligible study population comprised 13,495 students, including 7283 junior (54.0%) and 6212 senior (46.0%) high school students, with a mean age of 15.2 (*SD* = 1.80; range 11–20). Of these participants, 7,065 (52.4%) were boys. Data were collected by trained interviewers from November 11, 2014 to May 29, 2015, and our study was approved by the ethics committee of the Medical Association of Tongji Medical College, Huazhong University of Science and Technology, local educational administrative departments, and target school boards.

172 *2.2. Variables and Instruments*

173 *2.2.1. Demographic characteristics*

174 Participants indicated their age and gender, province (Anhui, Yunnan,
175 Guangdong, Heilongjiang, or Hubei), ethnicity (Han or minority), one-child family
176 (yes or no), family structure (nuclear family, extended family, single-parent family,
177 grandparent family, step family, or other), family income (low, average, or high), and
178 parents' highest educational achievement (less than primary school, junior high
179 school, senior high school, or more than college).

180 *2.2.2. Aggression scale*

181 Participants completed the Chinese version of Buss and Warren's Aggression
182 Questionnaire (BWAQ), an empirically validated and reliable measure of adolescent
183 aggression (Maxwell, 2007). This self-report scale comprises 34 items in 5 subscales:
184 physical aggression, verbal aggression, anger, hostility, and indirect aggression. All
185 items are rated on a 5-point Likert scale ranging from 1 (not at all like me) to 5
186 (completely like me). Higher total scores indicate higher aggression. Based on Buss
187 and Warren's interpretation of aggression, we categorized students with "high
188 average", "high", or "very high" as exhibiting aggression (Zhang, 2011).

189 *2.2.3. Stressful life events scale*

190 Liu developed the Adolescent Self-Rating Life Events Checklist (ASLEC) in
191 1987. The ASLEC consists of 27 items that evaluate the frequency of adolescents'
192 exposure to certain stressful life events and the extent of their negative influence in
193 the past 12 months (Wang, 1999). The ASLEC yields a total score and six subscale

194 scores including interpersonal relations, academic pressure, punishment, loss, health
195 adaptation difficulties, and other troubles (e.g., “dislike going to school”, “failure in
196 love”). Participants first indicated whether the specific life event had occurred. If
197 they had experienced it, they rated the degree to which it had negatively affected
198 them on a 5-point Likert scale ranging from (no effect) to 5(extremely severe).
199 Higher scores indicated a greater negative impact of the stressful events. Scores were
200 categorized into two categories: no effect (responded “no effect” and “mild”) and
201 had an effect (responded “moderate”, “severe”, or “extremely severe”) (Wang,
202 1999).

203 *2.2.4. Emotional management scale*

204 Four items from Goleman’s (1995) Emotional Intelligence Inventory were used
205 to assess emotional management and determine whether participants could
206 reasonably manage their negative emotions. Each item is rated on a 4-point Likert
207 scale ranging from 1 (always like this) to 4 (never like this). Higher scores indicated
208 higher levels of emotion management (Goleman, 1995). The thresholds were poor (<
209 1 SD from the mean), average (1 SD $\leq$ mean $\leq$ 1 SD), and good (> 1 SD from the
210 mean).

211 *2.2.5. Social support scale*

212 The Chinese version of the Adolescent Social Support Scale was administered to
213 measure participants’ individual differences in social resource utilization. This
214 questionnaire comprises 3 subscales: subjective support, objective support, and
215 support usage. Each item is rated from 1 to 5, with higher scores indicating more

perceived social support. Participants were grouped using the same criteria used for emotional management (Dai, 2014).

2.2.6. Neglect scale

Measurement of neglect was assessed using 5 items from the Parent-Child Conflicts Tactic Scale. These items evaluated whether participants suffered from corresponding parental neglect during the past 12 months (e.g., "were not able to make sure you got to a doctor or hospital when you needed it"). Participants with a total score of ≥ 1 were classified as having experienced neglect (Straus et al., 1998).

2.3. Data analysis

Depending on the variable types, means and standard deviations or percentages were calculated for all variables to describe the sample characteristics. Chi-square tests and Student's *t*-tests were employed to compare categorical and continuous data, respectively. The internal consistency reliability of the scales were calculated using Cronbach's α coefficient. Univariate logistic regression was first analyzed the impact of risk factors on aggression. Subsequently, multivariate logistic regression analysis was used to explore the association between aggression and stressful life events after controlling for neglect, emotional management, adolescent social support, and demographic characteristics. Odds ratios (ORs) and 95% confidence intervals (CIs) were reported for all potential factors entered into logistic regression models. The significance level was set at $P < 0.05$, and all tests were two-sided. Statistical analyses were conducted using SPSS Statistics 16.0 for Windows (SPSS Inc., Chicago, IL).

3. Results

3.1 Reliability assessment of scales

The Chinese version of the BWAQ had good internal consistency reliability in a previous study (Maxwell, 2008): physical aggression, 0.81; verbal aggression, 0.71; anger, 0.64; hostility, 0.61; and indirect aggression, 0.62. In the present study, the Cronbach's α of the whole BWAQ was 0.87, while those for the subscales were 0.75, 0.52, 0.61, 0.70, and 0.58, respectively. The Cronbach's α of the ASLEC was reported to be 0.85 in Liu (1997), and it was 0.92 in this study. The emotional management scale's Cronbach's α was 0.75 in Goleman (1995) and 0.76 in the present study. Finally, the Cronbach's α values of the social support and neglect scales in the present study were 0.94 and 0.72, respectively.

3.2. Aggression and other variables divided by gender

A total of 13,495 students (7,065 boys and 6,430 girls) with a mean age of 15.2 years (*SD* = 1.80) were analyzed. In Table 1, descriptive statistics for demographic characteristics and other variables, divided by gender, are summarized. The self-reported aggression prevalence rate was 24.3%, with a significant gender difference (χ^2 = 12.305, $P < 0.001$), since boys reported to had been more aggressive than girls. Moreover, boys had a relatively higher prevalence rate of physical aggression and verbal aggression (χ^2 = 342.905, 44.347; $P < 0.001$), whereas girls engaged more in anger (χ^2 = 55.740, $P < 0.001$). The groups did not differ significantly in hostility and indirect aggression (χ^2 = 0.043, 0.048; $P > 0.10$).

The ASLEC total scores and subscale scores for punishment, loss, and other

troubles were significantly higher in boys than in girls (t = 5.951, 11.046, 4.431, and 18.570, respectively; P< 0.001). However, the scores for academic pressure and neglect tended to be lower in boys compared to girls (t = -7.071, -6.658; P< 0.001). Boys had higher emotional management scores than girls (t = 7.840, P< 0.001), while girls had more social support than did boys (t = -15.528, P< 0.001).

3.3. Association between aggression and variables

As shown in Table 2, participants who had experienced neglect, interpersonal problems, academic pressure, punishment, loss, health adaptation difficulties and other troubles showed greater risk for aggression during the previous 12 months. High levels of emotional management or social support lowered the odds of aggression. Family income and province were significantly associated with aggression (P < 0.001). The odds ratio of aggression in boys was 1.15 times higher than that in girls, and the 17–20 age group had a greater risk for aggression in comparison to the 11–13 age group (P < 0.001).

3.4. Association between aggression and stressful life events after adjustment for confounding variables

Multivariate logistic regression analysis was conducted to examine the association between aggression and stressful life events by controlling for demographic characteristics and other potential confounding variables in a stepwise fashion (Table 3). Model I indicated that interpersonal problems (OR = 2.31, 95% CI [1.99–2.68]), punishment (OR = 1.13, 95% CI [1.02–1.25]), health adaptation difficulties (OR = 1.45, 95% CI [1.31–1.60]), and other troubles (OR = 2.31, 95% CI

[2.09–2.55]) significantly increased the odds of aggression after controlling for demographic characteristics. However, the associations between academic pressure, loss, and aggression were not statistically significant. In Model II, interpersonal problems, health adaptation difficulties, and other troubles remained positively correlated with aggression after controlling for demographic characteristics and neglect. Notably, neglect was a significant risk factor for aggression ($\beta = 0.47$, SE = 0.05).

Greater emotional management was expected to be associated with decreased odds of adolescent aggression. Thus, we examined whether emotional management could influence the relationship between stressful life events and aggression in Model III. However, the associations between aggression and interpersonal problems (OR = 2.05, 95% CI [1.76–2.38]), health adaptation difficulties (OR = 1.24, 95% CI [1.12–1.37]), and other troubles (OR = 2.00, 95% CI [1.81–2.22]) remained, and there was no significant interaction effect of emotional management and stressful life events on aggression. The Model IV ORs indicated a greater odds of aggression among those exposed to interpersonal problems (OR = 2.03, 95% CI [1.75–2.36]), health adaptation difficulties (OR = 1.21, 95% CI [1.09–1.34]), and other troubles (OR = 1.93, 95% CI [1.74–2.14]) even after controlling for social support and the Model 1–III variables.

4. Discussion

The present study, which investigated the prevalence of aggression and the associated stressful life events in a large sample of high school students living in

Chinese rural areas, indicated that approximately 24.3% of participants reported to have been engaged in aggression. Among the stressful life events analyzed by our research, interpersonal problems, health adaptation difficulties, and other troubles represented the best predictors of adolescent aggression. Previous studies focusing exclusively on rural adolescents in Western countries reported that 14–33% of adolescents engaged in aggression (Swaim et al., 2006). As such, the results of the present study were consistent with those of Western studies as well as Zhang's study assessing rural Chinese students (Zhang, 1999). Additionally, we found a significant gender difference in aggression. Consistent with existing studies, boys were more likely to exhibit aggression than were girls (McEachern and Snyder, 2012). In a 5-year retrospective study from Di Lorenzo et al. (2016), aggressive behavior was the most frequent reason for psychiatric hospitalization among boys. This phenomenon is likely explained by "social role theory," whereby gender-related behavioral differences are culturally determined. Specifically, males are taught to be aggressive and competitive, whereas females are taught to be domestic and compassionate (Eagly, 1997). In addition, other authors have suggested that testosterone hormonal profile plays a key role in the association between being male and aggression, although this relationship has not been accepted by all researchers because of its "oversimplified" explanation of complex human behavior (Reimers and Diekhof, 2015; Carre and Olmstead, 2015). Unlike in previous studies, we found that adolescents from poor families were not more likely to have higher aggression rates compared with those from wealthy homes in Chinese rural areas. A possible

reason for this discrepancy is the characteristics of rural life in China. In particular, compared with parents with low socioeconomic status, those with high status may be at work more frequently or work in a different city. Consequently, parents may have little time to monitor or educate their children, thereby increasing the risk of adolescent aggression (She, 2009). If this conjecture is correct, further study of this association in rural China is required. Additionally, we found that adolescents from southwestern rural China exhibited more aggressive behavior than did those from central areas. This result may relate to the regional cultural and education level differences, which could be further examined in future research.

The present study showed that aggression was not associated with all kinds of stressors. Instead, they were specifically related to interpersonal problems, health adaptation difficulties, and other troubles, and this likely depends on the stressor frequency and intensity. We believe that this is the first time this relationship has been reported. Consistent with previous studies, interpersonal problems were the most common adolescent stressor and could lead to psychological turbulence and maladaptive behaviors (Yu, 2010). The significance of this relationship may be partially due to the complex effects of adolescents' experiences and surroundings. Adolescence is a critical period when self-control and stress cognition are limited. Thus, after experiencing interpersonal frustrations (e.g., feeling misunderstood or being rejected or alienated), these adolescents might utilize immature methods to resolve their problems in processing their experience. This is particularly the case for individuals with poor empathy, perspective taking, and emotional management

(Wang et al., 2014). The reason for the significant association between aggression and health adaptation difficulties might hinge on perceived stress. Specifically, when adolescents have good health adaptation, they tend to display more positive adaptation to stress induced by diseases or changes in their social environment. Furthermore, the cognitive threshold for stress could be an important factor for predicting aggression prediction (Kwak and Rudmin, 2014). Consistent with other studies, adolescents in our study were likely to encounter other troubles leading them to engage in aggression (e.g., “failure in love” or “disliking going to school”; Kearney, 2007).

The present study should be interpreted in light of several limitations. First, data were based on retrospective self-report, which may introduce potential under or overestimation of participants’ problems. Second, we did not consider other potentially relevant factors when assessing the association between stressful life events and aggression. These could include personality characteristics, self-esteem, psychological problems (e.g., anxiety, depression), impulsivity, and coping methods. Consequently, we have underestimated the strength of the association between stressful life events and aggression. Thus, the evaluation of these and other possible factors should be considered in future research. Third, this study was cross-sectional; therefore, it is not possible to test or infer causal processes linking stressful life events to aggression using our data. Thus, these findings should be validated using prospective and longitudinal study designs. Finally, although the aggression scale has been validated and used in a substantial number of studies, it does not address

specific forms of aggression (e.g., proactive or reactive). This should be considered in future research, as each aggression type has been associated with different neurobiological and neuroendocrine variables.

In conclusion, the present study provides evidence for a high prevalence of aggression among adolescents in rural areas of China, and revealed how stressful life events, particularly interpersonal problems and health adaptation difficulties, are associated with aggression. These results might help to increase our understanding of how individuals respond to negative experiences and enhance our awareness of how mental health and social services should implement more effective risk prevention programs for adolescents, as suggested in the literature (Hale et al., 2014), also in rural areas.

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Table 1

Descriptive of demographic characteristics and other variables, divided by gender.

	Boys (n = 7065)	Girls (n = 6430)	Total (n = 13495)
Age (Mean, SD)	15.24±1.80	15.23±1.81	15.23±1.80
Province (n, %)			
Anhui	1847 (26.1)	1438 (22.4)	3285 (24.3)
Yunnan	1056 (14.9)	1009 (15.7)	2065 (15.3)
Guangdong	1420 (20.1)	1436 (22.3)	2856 (21.2)
Heilongjiang	1260 (17.8)	1320 (20.5)	2580 (19.1)
Hubei	1482 (21.0)	1227 (19.1)	2709 (20.1)
Family structure (n, %)			
Nuclear family[a]	4688 (66.4)	4056 (63.1)	8744 (64.8)
Extended family[b]	1531 (21.7)	1544 (24.0)	3075 (22.8)
Single-parent family[c]	353 (5.0)	267 (4.2)	620 (4.6)
Blended family[d]	176 (2.5)	204 (3.2)	380 (2.8)
Step family[e]	92 (1.3)	148 (2.3)	240 (1.8)
Grandparent family[f]	225 (3.2)	211 (3.3)	436 (3.2)
One-child (n, %)	2978 (42.2)	1682 (26.2)	4660(34.5)
Father's education (n, %)			
Less than primary school	1342 (19.0)	1362 (21.2)	2704 (20.0)
Junior high school	3871 (54.8)	3445 (53.6)	7316 (54.2)
Senior high school	1288 (18.2)	1161 (18.1)	2449 (18.1)
More than college	564 (8.0)	462 (7.2)	1026 (7.6)
Mother's education (n, %)			
Less than primary school	2465 (34.9)	2167 (33.7)	4632 (34.3)
Junior high school	3290 (46.6)	3061 (47.6)	6351 (47.1)
Senior high school	912 (12.9)	879 (13.7)	1791 (13.3)
More than college	398 (5.6)	323 (5.0)	721 (5.3)
Family income (n, %)			
Low	1925 (27.2)	2035 (31.6)	3960 (29.3)
Average	2684 (38.0)	2468 (38.4)	5152 (38.2)
High	2456 (34.8)	1927 (30.0)	4383 (32.5)
Aggression (n, %)	1805(25.5)	1476(23.0)	3281(24.3)
PHY	2158(30.5)	1087(16.9)	3245(24.0)
VER	1741(24.6)	1277(19.9)	3018(22.4)
ANG	1484(21.0)	1702(26.5)	3186(23.6)
HOS	1826(25.8)	1672(26.0)	3498(25.9)
IND	1752(24.8)	1605(25.0)	3357(24.9)
Total ASLEC (Mean, SD)	28.58±20.12	26.55±19.53	27.62±19.86
Interpersonal problems	6.55±4.42	6.42±4.66	6.49±4.54
Academic pressure	7.16±4.41	7.70±4.48	7.41±4.45
Punishment	5.37±5.93	4.27±5.70	4.85±5.84
Loss	2.33±3.15	2.10±3.03	2.22±3.10
Health adaptation difficulties	3.73±3.25	3.67±3.21	3.70±3.23
Other troubles	3.45±3.57	2.39±3.02	2.95±3.36
Neglect (Mean, SD)	2.27±2.50	2.56±2.68	2.41±2.59
Emotional management (Mean, SD)	11.67±2.70	11.31±2.61	11.50±2.66
Social support (Mean, SD)	61.15±14.43	64.94±13.93	62.95±14.32

Note: [a]Nuclear family: living with both father and mother; [b]Extended family: living with parents, grandparents or maternal grandparents; [c]Single-parent family: living with father or mother; [d]Blended family: living with parents,

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grandparents, uncles or aunts; [e]Step family: living with stepfather or stepmother; [f]Grandparent family: living with grandparents; PHY: physical aggression; VER: verbal aggression; ANG: anger; HOS: hostility; IND: indirect aggression; ASLEC = Adolescent Self-Rating Life Events Checklist.

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Table 2

The odds ratios of related potential factors for predicting aggression in univariate logistic regression models.

		Aggression						Aggression			
		β	SE	OR	(95% CI)			β	SE	OR	95% CI
Province						Mother's education					
	Anhui			1.00			Less than primary school			1.00	
	Yunnan	0.139	0.063	1.15#	1.02～1.30		Junior high school	-0.009	0.045	0.99	0.91～1.08
	Guangdong	-0.137	0.060	0.87#	0.78～0.98		Senior high school	-0.045	0.065	0.96	0.84～1.09
	Heilongjiang	-0.139	0.062	0.87#	0.77～0.98		More than college	0.163	0.090	1.18	0.99～1.41
	Hubei	-0.146	0.061	0.86#	0.77～0.97	Family socioeconomic status					
Gender (boys)		0.141	0.040	1.15##	1.06～1.25		Low	-0.174	0.051	0.84##	0.76～0.93
Age							Average	-0.137	0.047	0.87##	0.80～0.96
	11～13			1.00			High			1.00	
	14～16	0.185	0.054	1.20##	1.08～1.34	Neglect (yes)		0.755	0.047	2.13##	1.94～2.34
	17～20	0.242	0.060	1.27##	1.13～1.43	Emotional management					
One-child (yes)		0.060	0.042	1.06	0.98～1.15		Poor			1.00	
Family structure							Average	-1.400	0.052	0.25##	0.22～0.27
	Nuclear family[a]			1.00			Good	-2.608	0.107	0.07##	0.06～0.09
	Extended family[b]	0.005	0.049	1.00	0.91～1.11	Social support					
	Single-parent family[c]	0.020	0.097	1.02	0.84～1.23		Poor			1.00	
	Blended family[d]	0.055	0.121	1.06	0.83～1.34		Average	-0.661	0.052	0.52##	0.47～0.57
	Step family[e]	0.205	0.146	1.23	0.92～1.63		Good	-1.282	0.073	0.28##	0.24～0.32
	Grandparent family[f]	0.309	0.107	1.36##	1.10～1.68	Total ASLEC (yes)		2.050	0.274	7.77##	4.54～13.28
Father's education						Interpersonal problems (yes)		1.366	0.069	3.92##	3.43～4.49
	Less than primary school			1.00		Academic pressure (yes)		0.893	0.074	2.44##	2.11～2.82
	Junior high school	-0.032	0.052	0.97	0.87～1.07	Punishment (yes)		0.829	0.042	2.29##	2.11～2.49
	Senior high school	-0.054	0.065	0.95	0.83～1.08	Loss (yes)		0.604	0.042	1.83##	1.69～1.99
	More than college	0.124	0.083	1.13	0.96～1.33	Health adaptation difficulties (yes)		0.902	0.044	2.46##	2.26～2.69
						Other troubles (yes)		1.200	0.042	3.32##	3.06～3.61

Note: [a]Nuclear family: living with both father and mother; [b]Extended family: living with parents, grandparents or maternal grandparents; [c]Single-parent family: living with father or mother; [d]Blended family: living with parents, grandparents, uncles or aunts; [e]Step family: living with stepfather or stepmother; [f]Grandparent family: living with grandparents; ASLEC = Adolescent Self-Rating Life Events Checklist; OR = Odd ratio, CI = 95% Confidence Interval; #$p < 0.05$, ##$p < 0.01$; n = 13495; SE = Standard Error.

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Table 3

Multivariate logistic regression models for predicting aggression.

	Model Ⅰ		Model Ⅱ		ModelⅢ		ModelⅣ	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Province (Anhui vs. Hubei)	1.15#	1.01～1.30	1.17#	1.03～1.32	1.08	0.95～1.23	1.10	0.97～1.26
Province (Yunnan vs. Hubei)	1.31##	1.14～1.50	1.34##	1.17～1.54	1.37##	1.19～1.58	1.43##	1.24～1.65
Province (Guangdong vs. Hubei)	1.11	0.97～1.27	1.13	0.99～1.29	1.11	0.97～1.27	1.11	0.96～1.27
Province (Heilongjiang vs. Hubei)	1.34##	1.17～1.54	1.39##	1.22～1.60	1.31##	1.14～1.51	1.35##	1.17～1.55
Gender	1.02	0.94～1.11	0.99	0.91～1.08	0.90#	0.82～0.98	0.93	0.85～1.02
Age in years	1.04##	1.01～1.06	1.04##	1.02～1.07	1.04##	1.02～1.07	1.04##	1.02～1.07
Income (average vs. low)	1.09	0.98～1.21	1.08	0.98～1.20	1.10	0.99～1.23	1.11	0.99～1.23
Income (high vs. low)	1.21##	1.08～1.34	1.21##	1.09～1.35	1.23##	1.10～1.38	1.26##	1.13～1.40
Interpersonal problems	2.31##	1.99～2.68	2.21##	1.91～2.57	2.05##	1.76～2.38	2.03##	1.75～2.36
Academic pressure	1.15	0.98～1.36	1.12	0.95～1.31	1.06	0.90～1.25	1.05	0.89～1.24
Punishment	1.13#	1.02～1.25	1.09	0.98～1.21	1.08	0.97～1.20	1.08	0.97～1.20
Loss	1.04	0.95～1.14	1.04	0.95～1.14	1.02	0.93～1.13	1.03	0.93～1.13
Health adaptation difficulties	1.45##	1.31～1.60	1.38##	1.25～1.53	1.24##	1.12～1.38	1.21##	1.09～1.34
Other troubles	2.31##	2.09～2.55	2.27##	2.05～2.50	2.00##	1.81～2.22	1.93##	1.74～2.14
Neglect	-	-	1.60##	1.45～1.77	1.48##	1.34～1.64	1.44##	1.30～1.59
Emotional management (average vs. poor)	-	-	-	-	0.31##	0.28～0.34	0.32##	0.29～0.36
Emotional management (good vs. poor)	-		-	-	0.14##	0.11～0.17	0.14##	0.12～0.18
Social Support (average vs. poor)	-		-	-	-	-	0.68##	0.61～0.77
Social support (good vs. poor)	-		-	-	-	-	0.53##	0.45～0.62
constant	-3.55		-3.80		-2.31		-2.01	

Note: OR = Odd ratio, CI = 95% Confidence Interval; #$p < 0.05$, ##$p < 0.01$; n = 13495.

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